




## SHORT REPORT

# Anesthetic outcomes in pediatric patients with COVID-19: A matched cohort study

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is now widespread in most countries. As evidence regarding the clinical implications of SARS-CoV-2 continues to evolve, such data are crucial to inform decision-making in health care. Pediatric patients with viral infections are known to be vulnerable to perioperative complications, often respiratory in nature.<sup>1</sup> Although the SARS-CoV-2 pandemic has been raging for over a year, limited information is available regarding the perioperative and anesthetic risks associated with concurrent SARS-CoV-2 infection, particularly in children. Several studies have demonstrated that postoperative pulmonary complications occur frequently in adult patients with perioperative SARS-CoV-2,<sup>2,3</sup> however, comparable data are not available for pediatric patients.

The following observational study compared anesthetic outcomes in pediatric patients with and without confirmed SARS-CoV-2 infection, undergoing general anesthesia. We hypothesized that children with confirmed SARS-CoV-2 infection are at an increased risk of developing post-anesthesia complications compared to those without. Secondarily, we hypothesized that an association exists between the presence of SARS-CoV-2-related symptoms and postanesthesia complications, among children with SARS-CoV-2.

We completed a single-center, retrospective, case-control study of 35 pediatric patients with confirmed SARS-CoV-2 infection who underwent anesthesia for a surgical procedure or diagnostic study and 70 non-SARS-CoV-2 control patients, matched 1:2 by age and type of procedure. SARS-CoV-2 infection was defined as detection of the SARS-CoV-2 virus on a polymerase chain reaction (PCR) test within 7 days prior to the anesthetic. All anesthetics occurred

between January 3, 2020, and September 24, 2020. The primary outcomes of the study included postanesthesia complications within 30 days of the procedure or diagnostic study under anesthesia. Secondary outcomes were 30-day mortality, hospital length of stay (LOS), and intraoperative complications. This study was approved by the institutional review board. Conditional logistic regression models were used to evaluate the relationship between cases and controls and prognostic factors.

The median age of the patients was 3.7 years (IQR 1–6) with 49% female. There were no significant differences in weight between cases and controls (Table 1). Among SARS-CoV-2 cases, the mean first positive PCR test was 2.6 days (95% CI 1.3 days, 4.0 days) prior to the anesthetic. Twenty-six percent of SARS-CoV-2 cases had postanesthesia complications compared with 1% of controls (OR = 18.00, 95% CI 2.49, 788.96,  $p = .0007$ ). This included a diagnosis of systemic inflammatory response syndrome, the need for prolonged invasive or noninvasive respiratory support, vasopressor requirement, clinically significant stridor, and a small pericardial effusion. Patients with SARS-CoV-2 were more likely to exhibit preoperative upper respiratory tract infection symptoms than controls. There were no deaths within 30 days of procedure. There was also no evidence for a difference in hospital LOS between the two groups and no intraoperative complications in either group. Comparing SARS-CoV-2 patients that were symptomatic ( $n = 13$ ) to those that were asymptomatic ( $n = 22$ ), there was no difference in the incidence of postanesthesia complications (4 cases among the symptomatic patients vs. 5 cases among the asymptomatic patients,  $p = .8869$ ) or in LOS (11.3 days among the symptomatic patients vs. 10.5 days among the asymptomatic patients,  $p = .8733$ ).

TABLE 1 Demographic characteristics and anesthesia outcomes

	SARS-CoV-2 diagnosis		OR (95% CI)	p-Value*
	Not detected (n = 70)	Detected (n = 35)		
Age, median, years	3.6 (0.9–6.5)	3.7 (0.9–6.3)		
Sex, n (%)				
Female	35 (50)	16 (46)		
Male	35 (50)	19 (54)		
Race, n (%)				
Asian	8 (11)	2 (6)		
Black or African American	20 (29)	13 (37)		
White	17 (24)	1 (3)		
Unknown / Not Reported	25 (36)	19 (54)		
Ethnicity, n (%)				
Hispanic or Latino	20 (29)	17 (49)		
Not Hispanic or Latino	50 (71)	18 (51)		
ASA, n (%)				
1–2	50 (71)	14 (40)		
3–5	20 (29)	21 (60)		
Number of chronic conditions, n (%)**				
None	50 (71)	20 (57)	1.0	
One	15 (21)	11 (31)	3.94 (0.89, 23.94)	.0769
Two or more	5 (7)	4 (11)	7.06 (0.57, 129.72)	.1641
Weight, median, kg	16.2 (9.9–25.9)	16.0 (9.4–28.0)	1.00 (0.96, 1.05)	.8270
Any URI symptoms at time of anesthetic, n (%)				
Absent	65 (93)	22 (63)	1.0	<b>.0001</b>
Present	5 (7)	13 (37)	21.07 (3.06, 907.48)	
Postanesthesia complications, n (%)				
Systemic Inflammatory Response Syndrome	0	2 (6)		
Respiratory support	1 (1)	7 (20)		
Vasopressors	0	2 (6)		
Ventilation ≥24 h	0	4 (11)		
Other pulmonary	0	4 (11)		
Thrombotic	0	0		
Hemorrhagic	0	0		
Cardiac	0	1 (3)		
Any postanesthesia complications, n (%)	1 (1)	9 (26)	18.00 (2.49, 788.96)	<b>.0007</b>
Hospital length of stay, mean ± sd, days	6.8 ± 15.9	10.8 ± 18.2	1.03 (0.99, 1.07)	.1515

Note: Symptoms include cough, fever, rhinorrhea, diarrhea, cervical lymphadenopathy, sore throat, or acute respiratory failure.

Bold value indicates  $p < .05$ .

Abbreviation: URI, upper respiratory infection.

\*p-Value from stratified exact logistic regression models.

\*\*p-Value = .0546 with the number of chronic conditions as a quantitative variable defined as 0 = no chronic conditions, 1 = one chronic condition, and 2 = two or more chronic conditions.

Chronic conditions included: asthma, congenital heart disease, cancer, history of prematurity, diagnosed congenital syndrome with multiple comorbidities, or other. Other conditions included hepatoblastoma, seizures, sickle cell anemia, or history of necrotizing enterocolitis with dependence on total parental nutrition.

In the adult literature, SARS-CoV-2-positive surgical patients are at higher risk of serious adverse events than their SARS-CoV-2-negative counterparts, even when they are asymptomatic at the time of the procedure.<sup>1,2</sup> Our study suggests that a similar pattern may be present in SARS-CoV-2-positive pediatric patients as well. In addition to the risk of SARS-CoV-2 transmission to healthcare workers, an increased need for respiratory support in the postanesthesia period, even for patients who are asymptomatic, suggests that elective procedures and examinations under anesthesia should be postponed in SARS-CoV-2 positive patients. In line with this, current guidelines recommend postponing elective surgery until the patient is no longer infectious and has demonstrated recovery from SARS-CoV-2.<sup>4</sup> Importantly, while adult studies have demonstrated increased mortality, our study population had no 30-day mortality. However, our analysis is limited by the small number of patients in this study. As the pandemic continues, the number of SARS-CoV-2-positive pediatric patients will only continue to grow, warranting further studies to continue to guide best practice.

SARS-CoV-2-positive pediatric patients undergoing surgical procedures or examinations under anesthesia may be at higher risk for immediate postanesthesia complications than their SARS-CoV-2-negative counterparts. SARS-CoV-2 status is important to discern in evaluating risk for postanesthesia complications in this patient population.

#### CONFLICT OF INTEREST

The authors report no conflict of interest.

#### DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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